

CLAIMS

What is claimed is:

1 1. A method for designing a system on a target device utilizing field programmable gate
2 arrays (FPGAs), comprising:
3 synthesizing a design for the system;
4 mapping components in the design onto resources on the target device;
5 determining placement locations for the components on the target device; and
6 identifying components to replicate in response to criticality determined from the
7 placement locations.

1 2. The method of Claim 1, wherein identifying components to replicate comprises
2 identifying a replication candidate with associated slack that exceeds a threshold value.

1 3. The method of Claim 2, further comprising determining a location for a duplicate of
2 the replication candidate.

1 4. The method of Claim 3, further comprising determining slack gain associated with the
2 duplicate of the replication candidate at the location.

1 5. The method of Claim 4, further comprising computing a gain value for the duplicate
2 of the replication candidate.

1 6. The method of Claim 5, wherein computing the gain value comprising evaluating
2 slack gain, the associated slack of the replication candidate, and illegalities associated with
3 placement at the location.

1 7. The method of Claim 5, further comprising designating n components with a highest
2 gain value as the components to replicate.

1 8. The method of Claim 1, further comprising performing incremental placement on
2 duplicates of the components to replicate.

1 9. The method of Claim 8, further comprising:
2 identifying additional components to replicate; and
3 performing incremental placement on the duplicates of the additional components to
4 replicate.

1 10. The method of Claim 8, further comprising routing the components and the
2 duplicates of the components to replicate.

1 11. The method of Claim 1, further comprising removing a duplicate if a location of the
2 duplicate is in a logic array block with its corresponding component to replicate.

1 12. The method of Claim 8, further comprising determining system slack for the system.

1 13. The method of Claim 12, further comprising restoring the system to its previous
2 design if the system slack has decreased.

1 14. A method for designing a system on a target device utilizing field programmable gate
2 arrays (FPGAs), comprising:
3 determining placement locations for components on the target device;

4 identifying components to replicate in response to criticality determined from the
5 placement locations; and
6 performing incremental placement to resolve an illegality in placement of a duplicate of a
7 component to replicate.

1 15. The method of Claim 14, wherein identifying components to replicate comprises
2 identifying a replication candidate with associated slack that exceeds a threshold value.

1 16. The method of Claim 15, further comprising determining a location for a duplicate of
2 the replication candidate.

1 17. The method of Claim 16, further comprising determining slack gain associated with
2 the duplicate of the replication candidate at the location.

1 18. The method of Claim 17, further comprising computing a gain value for the duplicate
2 of the replication candidate.

1 19. The method of Claim 18, wherein computing the gain value comprising evaluating
2 slack gain, the associated slack of the replication candidate, and illegalities associated with
3 placement at the location.

1 20. The method of Claim 18, further comprising designating n components with a highest
2 gain value as the components to replicate.

1 21. The method of Claim 14, wherein performing incremental placement to resolve
2 illegalities in placement of duplicates of the components to replicate comprises:

3 generating a proposed move for the duplicate;
4 generating cost function values for a current placement with the proposed move; and
5 accepting the proposed move if its associated cost function value is better than the cost
6 function value of the current placement.

1 22. The method of Claim 21, wherein generating the proposed move comprises moving
2 the duplicate to a logic-array block (LAB) that is a fanin of the duplicate.

1 23. The method of Claim 21, wherein generating the proposed move comprises moving
2 the duplicate to a logic-array block (LAB) that is a fanout of the duplicate.

1 24. The method of Claim 21, wherein generating the proposed move comprises moving
2 the duplicate to a logic-array block (LAB) that is a sibling of a LAB where the duplicate resides.

1 25. The method of Claim 21, wherein generating the proposed move comprises moving
2 the duplicate to a logic-array block (LAB) that is adjacent to the duplicate.

1 26. A machine-readable medium having stored thereon sequences of instructions, the
2 sequences of instructions including instructions which, when executed by a processor, causes the
3 processor to perform:

4 synthesizing a design for a system;
5 mapping components in the design onto resources on a target device;
6 determining placement locations for the components on the target device; and
7 identifying components to replicate in response to criticality determined from the
8 placement locations.

1 27. The machine-readable medium of Claim 26, wherein identifying components to
2 replicate comprises identifying a replication candidate with associated slack that exceeds a
3 threshold value.

1 28. The machine-readable medium of Claim 27, further comprising instructions which
2 when executed further performs determining a location for a duplicate of the replication
3 candidate.

1 29. The machine-readable medium of Claim 28, further comprising instructions which
2 when executed further performs determining slack gain associated with the duplicate of the
3 replication candidate at the location.

1 30. The machine-readable medium of Claim 29, further comprising instructions which
2 when executed further performs computing a gain value for the duplicate of the replication
3 candidate.

1 31. The machine-readable medium of Claim 30, wherein computing the gain value
2 comprising evaluating slack gain, the associated slack of the replication candidate, and illegalities
3 associated with placement at the location.

1 32. The machine-readable medium of Claim 30, further comprising instructions which
2 when executed further performs designating n components with a highest gain value as the
3 components to replicate.

1 33. The machine-readable medium of Claim 26, further comprising performing
2 incremental placement on duplicates of the components to replicate.

- 1 34. The method of Claim 1, wherein identifying components to replicate comprises
- 2 identifying a replication candidate with associated path delay that exceeds a threshold value.